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ILLUSTRATIONS OF FRESH WATER ALGAE TOXIC TO ANIMALS

William Marcus Ingram, et al

Public Health Service
Cincinnati, Ohio

June 1952

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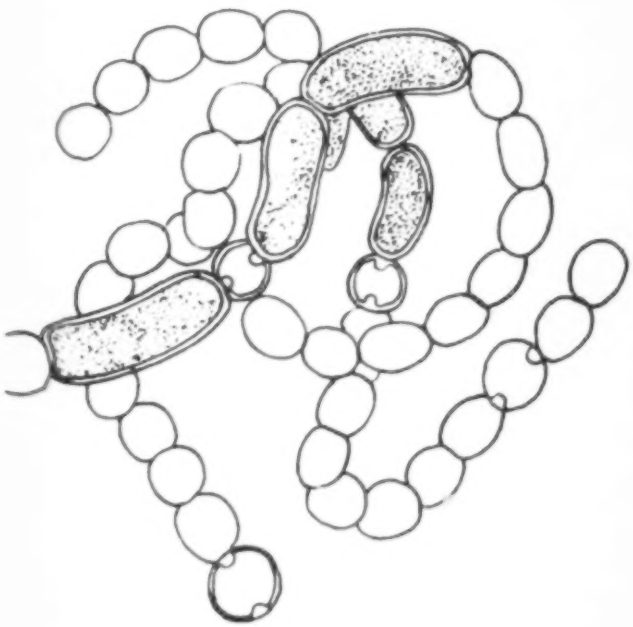

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OHIO—TENNESSEE DRAINAGE BASINS OFFICE
DIVISION OF WATER POLLUTION CONTROL
FEDERAL SECURITY AGENCY
PUBLIC HEALTH SERVICE
CINCINNATI, OHIO

ILLUSTRATIONS OF FRESH-WATER ALGAE TOXIC TO ANIMALS

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INTRODUCTION

Illustrations of the so-called toxic algae are presented here to aid those working in water pollution control programs who may have cause to identify certain ones that have purportedly caused death or illness in animals. The illustrations represent species of algae that have been reported associated with livestock, poultry, fish, and wildlife deaths through direct toxic action.

An additional aim of this paper is to bring a response, by personal communication or by publication, from those who may positively associate animal deaths or illness with certain algae. Thus, if animal deaths are attributed to algae in States in the Ohio-Tennessee Drainage Basins, a comprehensive report can be forthcoming eventually from accumulated data.

In investigating deaths of animals, teamwork involving several scientific skills may be required to ferret out causative agents. An abundance of any one of the illustrated algae in a lake or stream with dead livestock or expiring water fowl on the bank should not necessarily point to algae as the killers. Conceivably a bacteriologist, chemist, or veterinarian may have to participate in a diagnosis if the cause of death is to be determined correctly. A bacteriologist, for example, might show that the death of water fowl is caused by the type C toxin from the bacterium, Clostridium botulinum, rather than from algae. A chemist

might point to toxic materials other than those naturally produced while a veterinarian might list one of a dozen or more diseases as a cause of death.

A representative bibliography on toxic algae is appended. References include those related to toxic algae as they have been reported responsible for animal deaths and illness in the field, and those dealing with experimental laboratory work. The bibliography does not deal with specific references to toxic algae as they may or may not relate to human illness.

TOXIC ALGAE (CYANOPHYTA)

The algae that have been reported as causing death and, or, illness in domestic animals, fish, and wildlife through toxic action are, as far as are known, the blue-greens, Cyanophyta. The Cyanophyta can be differentiated from other groups of algae primarily by the fact that their pigments are not contained in pigment bodies (Chromatophores). Unlike all other algae, the pigments are in solution and are more or less confined to the peripheral portion of the protoplast. Included are chlorophyll-a; carotenes; distinctive xanthophylls; a blue pigment, c-phycocyanin; and a red pigment, c-phycoerythrin. The blue-green algae posses a primitive type of nucleus, the central body, which lacks a nuclear membrane and a nucleolus.

The genera of the Cyanophyta that appear to possess toxic species are: Microcystis (Figs. 1-4), Anabaena (Fig. 7), Aphanizomenon (Figs. 5-6), Nodularia (Fig. 14), Gloeotrichia (Figs. 12-13), and Coelosphaerium (Figs. 8-11).

If systematic information on different species of algae that may be related to toxic ones is desired, the following books can serve: Prescott, G. W., 1951, Algae of the Western Great Lakes Area, 946 pp., Cranbrook Press, Bloomfield Hills, Michigan, or Smith, G. M., 1950, The Fresh-Water Algae of the United States, 719 pp., McGraw-Hill Book Co., New York.

DESCRIPTION OF ALGAE ILLUSTRATIONS

Fig. 1. Microcystis aeruginosa Kütz. A colony of cells showing clathrate and perforate gelatinous sheath inclosing numerous, irregularly arranged individuals.

Fig. 2. Microcystis aeruginosa Kütz. Individual cells showing the false vacuoles which refract the light and give the colony a 'blackish' appearance when viewed microscopically.

Fig. 3. Microcystis flos-aquae (Wittr.) Kirch. A globular colony.

Fig. 4. Microcystis flos-aquae (Wittr.) Kirch. Individual cells with homogeneously granular contents.

Fig. 5. Aphanizomenon flos-aquae (L.) Ralfs. Diagram of flake-like colonies as they appear macroscopically.

Fig. 6. Aphanizomenon flos-aquae (L.) Ralfs. Individual trichomes, showing (right) the enlarged spore and the heterocyst (left) characteristically located near the median region of the plant.

Fig. 7. Anabaena flos-aquae (Lyngb.) Bréb. A tangled filament showing the sausage-like spores.

Fig. 8. Coelosphaerium Kuetzingianum Naeg. Colony.

Fig. 9. Coelosphaerium Kuetzingianum Naeg. A few cells showing homogeneously granular content.

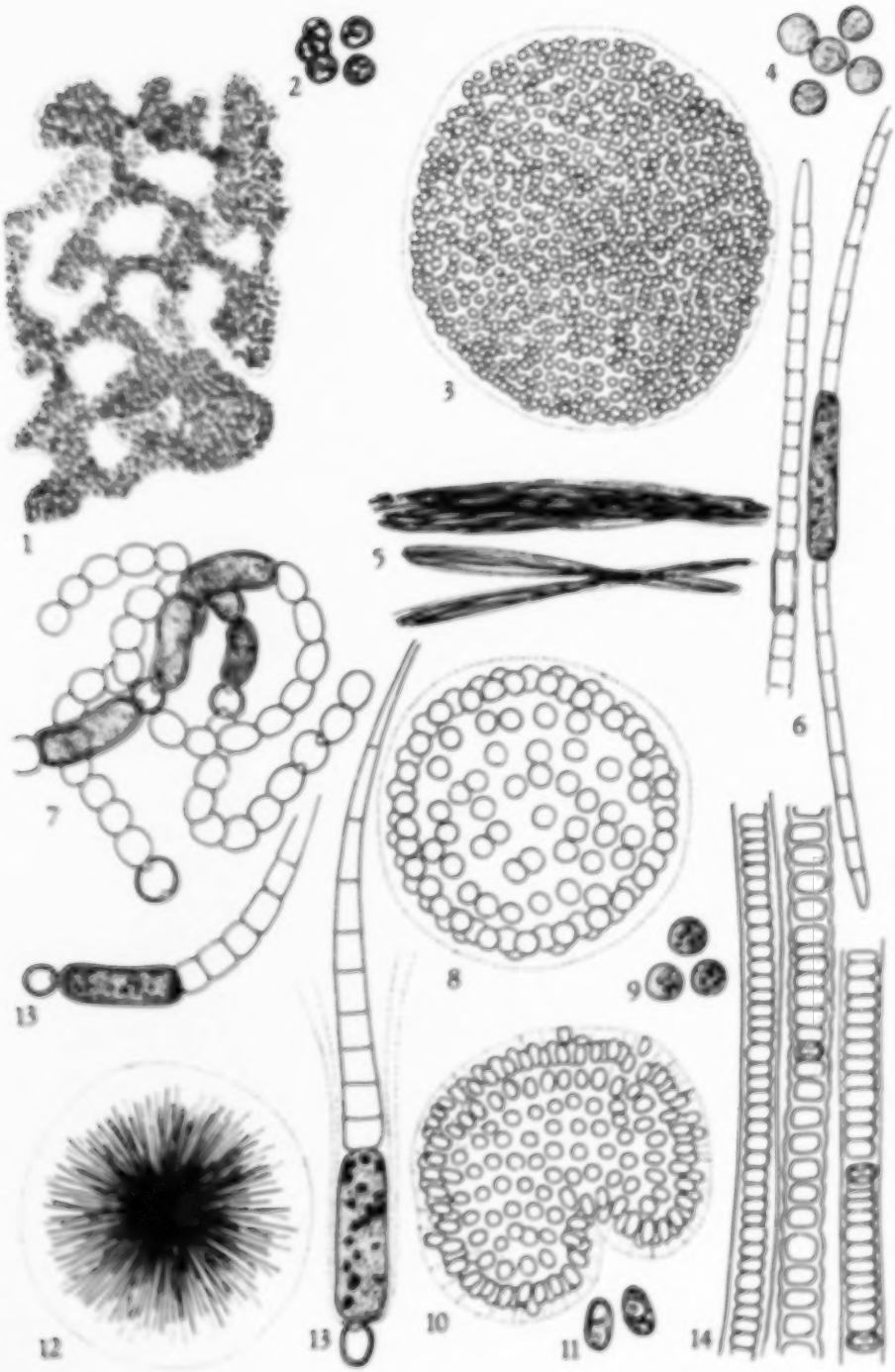
Fig. 10. Coelosphaerium Naegelianum Unger. Colony in which radiating fibrils are often visible; the cells crowded at the periphery of the colonial sheath.

Fig. 11. Coelosphaerium Naegelianum Unger. Few cells showing false vacuoles which refract the light and give the colony a brownish or purplish color when viewed microscopically.

Fig. 12. Gloeotrichia echinulata (J. E. Smith) P. Richter. Diagram of colony in which filaments radiate from a common center, forming tapioca-like bodies suspended in the water.

Fig. 13. Gloeotrichia echinulata (J. E. Smith) P. Richter. Individual plants showing basal heterocyst and spore, from which the vegetative cells taper to a hair-like extremity.

Fig. 14. Nodularia spumigena Mert. Filaments of short, compressed cells.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